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Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601
ENVIRONMENTAL SCIENCES DIVISION
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U.S. Department of the Interior, Bureau of Outdoor Recreation, Regional Director, Mid-Continent Region, Box 25387, Building 41, Denver Federal Center, Denver, CO 80225
U.S. Department of the Interior, National Park Service, Regional Director, Rocky Mountain Region, Box 25287, 655 Parfet Avenue, Denver, CO 80215
U.S. Department of the Interior, Missouri River Basin, Special Assistant to the Secretary, Room 688, Building 67, Denver Federal Center, Denver, CO 80225
Environmental Protection Agency, Deputy Regional Administrator, Region VIII, Suite 900, 1860 Lincoln Street, Denver, CO 80203
Federal Housing Administration, Housing and Urban Development, Office of the Director, 616 Helena Avenue, Helena, MT 59601
Bureau of Land Management, Montana State Office, Box 30157, Billings, MT 59107
Department of the Army, Omaha District Corps of Engineers, 7410 U.S. Post Office and Courthouse, Omaha, NE 68102
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Honorable Edmund P. Sedivy, Mayor of Bozeman, Box 640, Bozeman, MT 59715
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Don Barrick, City of Bozeman, Box 640, Bozeman, MT 59715
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Reviewer:

The enclosed final environmental impact statement has been prepared for the proposed Main Mall shopping center in Gallatin County. This impact statement is submitted for your consideration. Comments and questions will be accepted for 30 days after the date of this publication. If no communication occurs during the time period it will be assumed the person or agency does not have any comments. An extension, not to exceed 15 days, may be requested. All comments should be sent to: Tom Ellerhoff, Environmental Sciences Division, Department of Health & Environmental Sciences, Board of Health Building, Helena, MT, 59601.

Sincerely,

Homer G. Wheeler

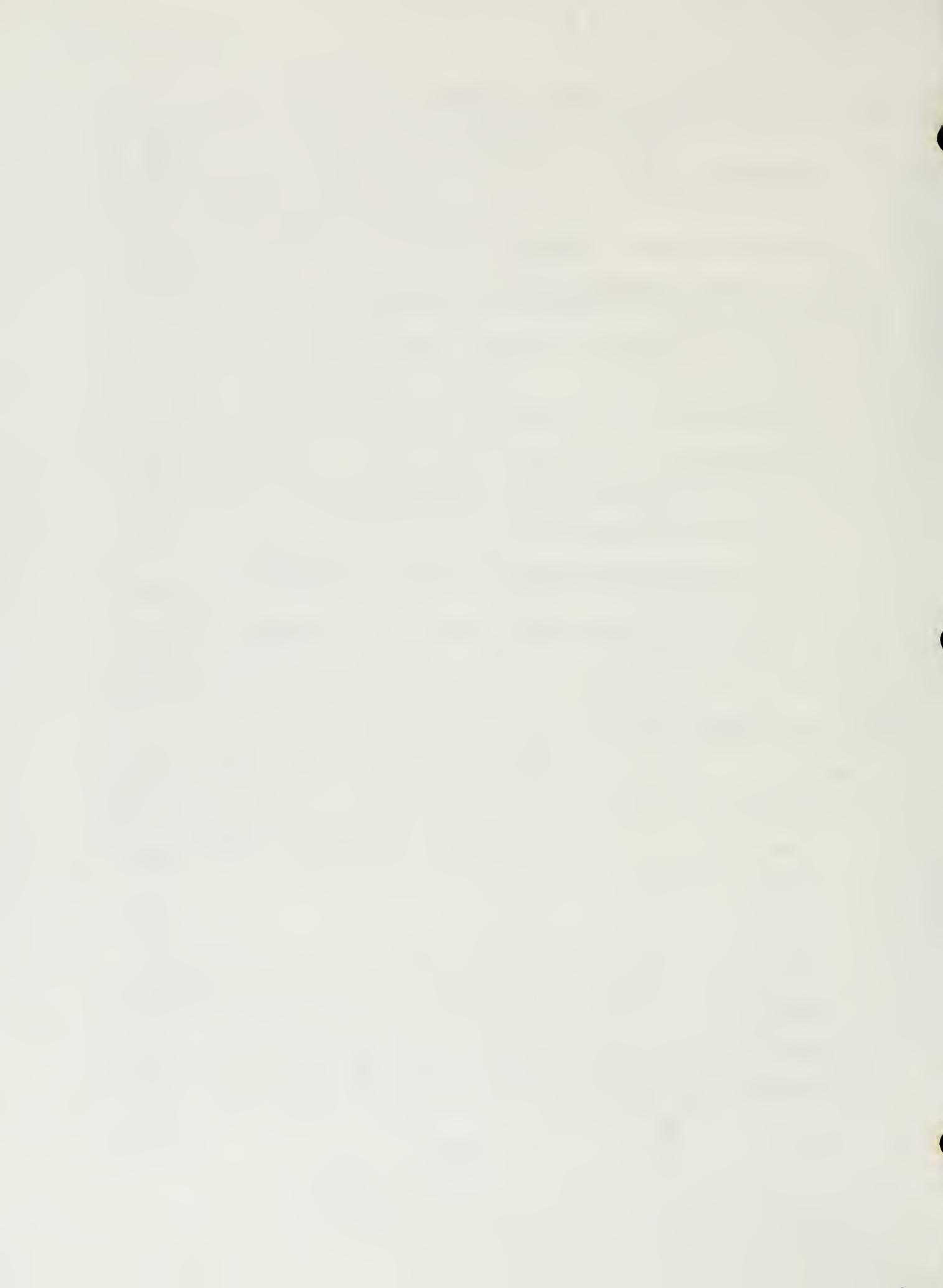
Homer G. Wheeler, P.E.
Ass't Admin.-Eng. Div.
Department of Highways

D.G. Willems

D.G. Willems, P.E., Chief
Water Quality Bureau
Department of Health and
Environmental Sciences

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MONTANA DEPARTMENT OF HIGHWAYS
AND
MONTANA DEPARTMENT OF HEALTH
AND
ENVIRONMENTAL SCIENCES

FINAL ENVIRONMENTAL IMPACT STATEMENT

MAIN MALL SHOPPING CENTER

Pursuant to the Montana Environmental Policy Act, Section 69-6504 (b) (3), Administrative Rules of Montana 16-2.2 (2) - P2000 et. seq. and 18-2.2 (2) - P210 et. seq., the following final environmental impact statement (EIS) was prepared by the Montana Department of Health and Environmental Sciences (DHES) and Department of Highways (DOH) concerning a traffic approach permit pursuant to Department of Highways - Powers and Duties, Title 32, Chapter 24, RCM, 1947, and administrative approval of the MAIN MALL SHOPPING CENTER, a proposed development west of Bozeman, Montana, pursuant to the Public Water Supply Act, Title 69, Chapter 49, RCM, 1947.

I. DESCRIPTION

Harry and Kathleen Daum propose to build the Main Mall Shopping Center just west of the city limits, north of U.S. Highway 191 (Southern $\frac{1}{2}$, Southwestern $\frac{1}{4}$, Section 11, Township 2 South, Range 5 East (See attached Map #1). The 39.69 acres will include the main complex of stores, a store not attached to the mall and parking (See attached Map #2).

II. RECOMMENDATIONS

In the draft EIS the DHES and the DOH made the following recommendations:

DHES

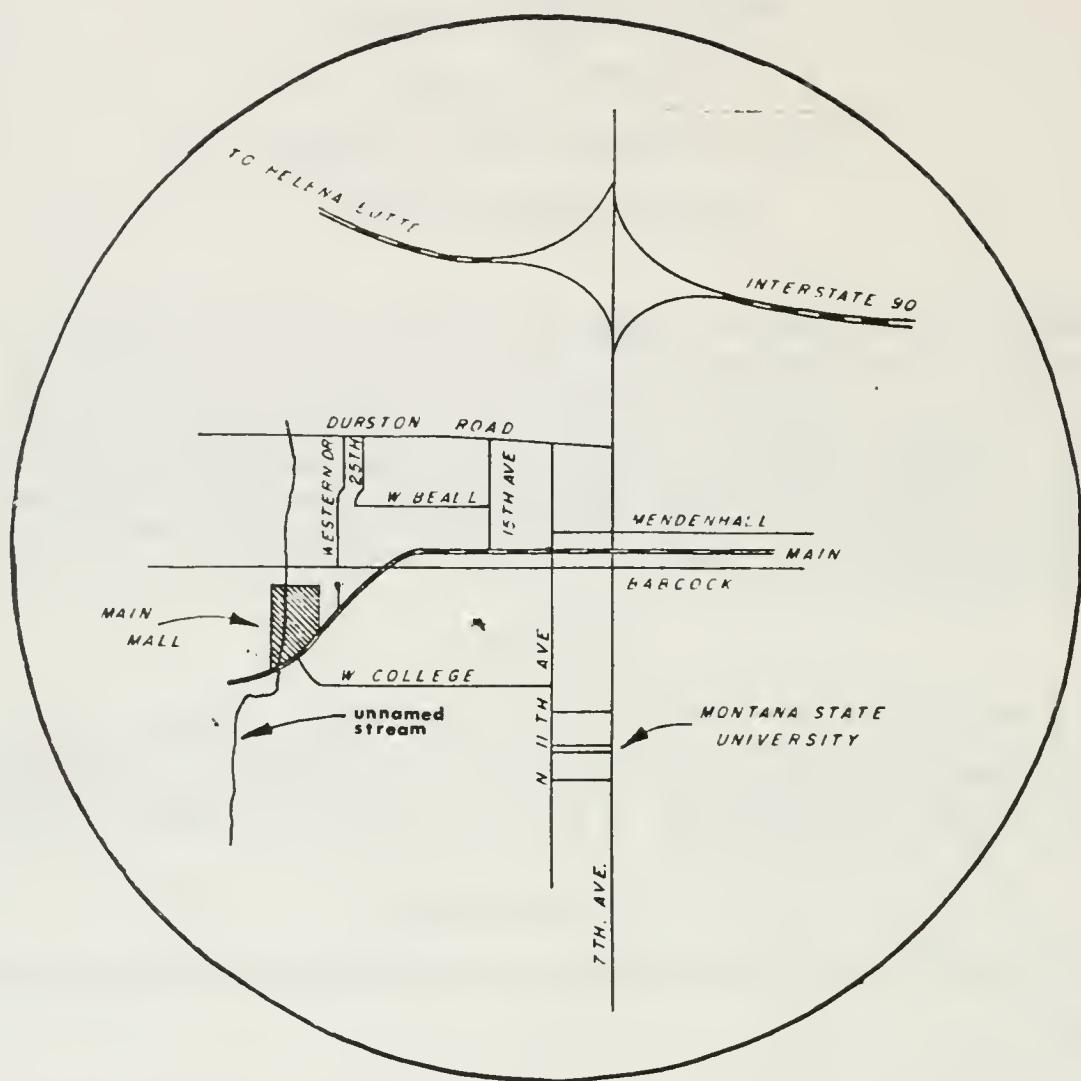
The DHES recommended the Main Mall be granted approval after the development corporation complies with the following conditions:

- A. Approval by the DHES of plans and specifications for the proper disposal of stormwater runoff.
- B. Approval of a Form 310 permit for the alteration of the stream running through the property.

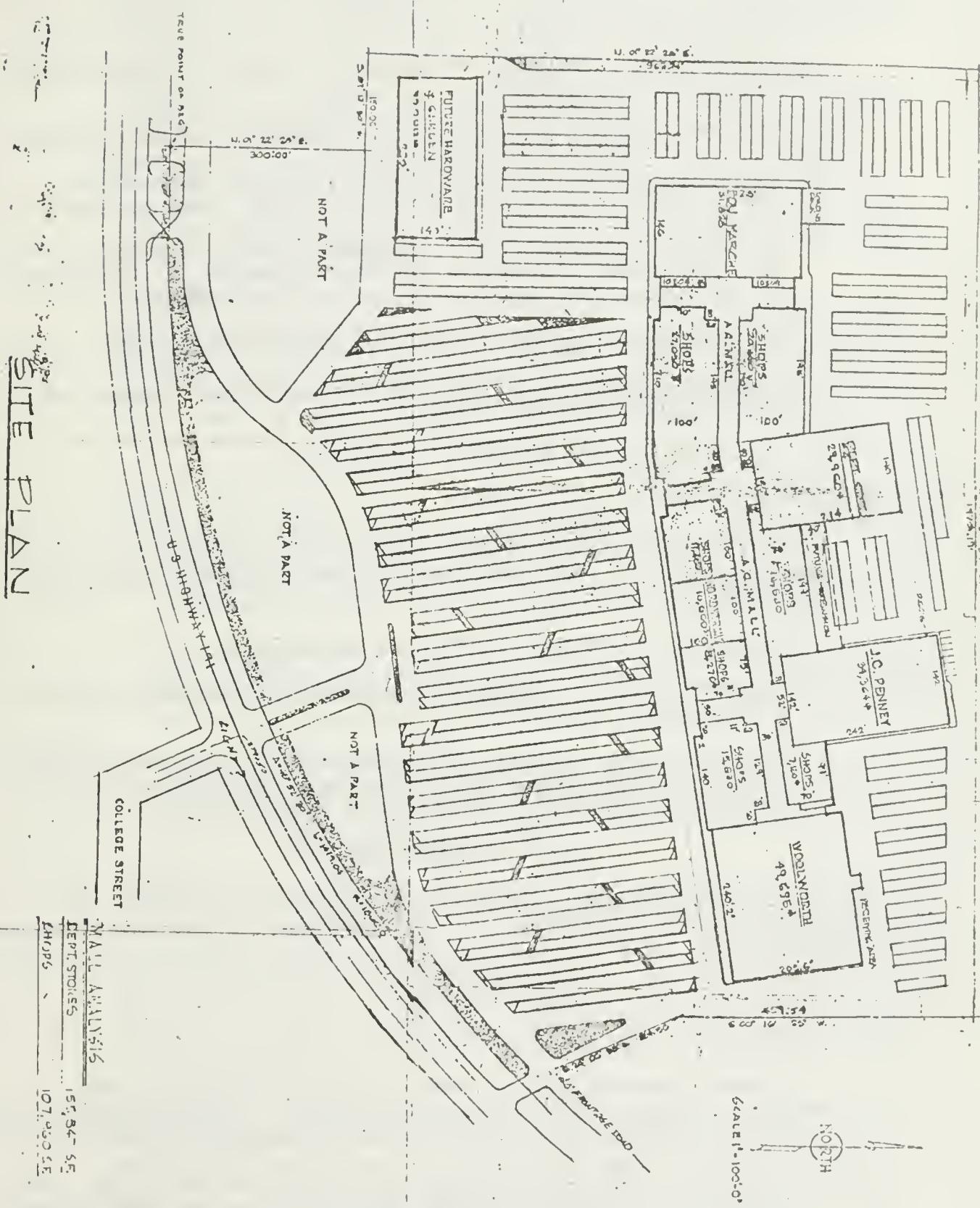
DOH

Assuming some type of commercial/business interests will develop the area, the negative effects on user and through traffic will be minimized by proper planning for traffic, with few access points to the public highway and common "off highway" parking.

Map #1



Map #2



III. STATUS OF THE DHES CONDITIONS

A. Stormwater Runoff Plans

The developer has submitted a proposal to the DHES for the treatment and flow of stormwater runoff.

The proposed system is designed to meet the following specifications:

- 1) It will be built to handle water from a five year storm of 30 minutes duration and with an intensity of 1.37 inches per hour,
- 2) the overflow structure will be designed to limit the overflow of five year storms of more than 110 minutes duration to 125 percent or less of what the runoff would be without the development,
- 3) any overflow will receive at least 100 minutes of detention,
- 4) a manually operated oil skimmer with an underground storage tank will be used to collect oil and
- 5) the bottom of the pond will not be sealed.

B. Form 310 Permit

The Gallatin Conservation District conditionally approved the Form 310 Permit December 20, 1977. The conditions for the permit (Appendix A) includes:

- 1) Approval of stormwater runoff plans by the DHES,
- 2) sediment pollution into the stream be held to a minimum during construction and
- 3) a green belt be left along the stream or the stream channeled into a culvert (if the stream is enclosed, an energy dissipater must be used on the exit end of the culvert to prevent soil erosion).

IV. REFERENCED MATERIAL

The DHES and DOH reference all material in the draft EIS except for the information dealing with air quality. The air quality section has been discussed in greater detail.

V. AIR QUALITY

A. Introduction

The proposed shopping center's effect on air quality depends upon a variety of factors. Some factors are uniform for the entire Bozeman area, such as the existing air quality, the meteorology and topography.

- 1) EXISTING AIR QUALITY: The federal government has ambient air standards for six pollutants: carbon monoxide (CO), total suspended particulate (TSP), nitrogen oxides (NO_x), oxidants (O_x), hydrocarbons (HC) and sulfur dioxide (SO₂). Only CO and TSP are likely to be a problem in Bozeman as a result of the proposed shopping center. Bozeman's

population (18,670 people in 1970) is generally considered too small to cause a problem with NO_x, O_x and HC. Bozeman's degree of industrial activity is considered too limited to cause a problem with SO₂.

Carbon Monoxide: It has been assumed that currently there are no violations of CO ambient air quality standards. The lack of heavily traveled arterial streets intersecting one another in a congested place is the principle reason for this assumption. Furthermore, there are no CO monitors operating in Bozeman. We may assume that the peak background concentration of CO in Bozeman for an hour long period is less than for a bigger city. A CO study in Billings used 3 parts per million (ppm)/1 hr. period. It is estimated that 2 ppm/hr. is reasonable for Bozeman.

Total Suspended Particulate: The Hi-vol (high volume) monitor on the campus of Montana State University has recorded a geometric mean of approximately 28 micorgram (ug) cubic meter (m³) during three months of operation (January-March of 1978). The area is relatively free of motor vehicle traffic and industrial sources near the monitoring site. Readings would be higher near locations of high particulate emissions, such as frequently traveled roads.

- 2) METEOROLOGY: Air quality in Bozeman is influenced by its meteorology. Bozeman's situation is similar to other cities in Montana experiencing violations of federal ambient standards (Refer to Table 1):
 - a. Wind Speed: This factor determines to a large degree how much dilution of pollutants will take place in a city's air shed.
 - b. Ambient Temperature: This factor affects the amount of CO emissions from cars while they are idling and it extends the length of the cold start operating conditions for cars. It will also affect the emissions from sources for heating buildings.
 - c. Precipitation: This factor generally affects all fugitive dust emissions, especially the particulate emissions from paved and unpaved roads. Bozeman does receive more precipitation per year than the other (listed in Table 1) cities.
- 3) TOPOGRAPHY: The topography is important because it can prevent polluted air from being blown away or diluted. Mountain valleys have a tendency to experience inversions which cause polluted air to become trapped in the valleys. Bozeman, Butte and Missoula are in mountain valleys. The bowl formed by mountains around Bozeman is larger than the bowl around Butte or Missoula, but Bozeman is located at the eastern most end of the Gallatin Valley. Pollutants created in that valley usually move from west to east and accumulate against that eastern mountain border if an inversion occurs.
- 4) POPULATION: In 1970 the population within Bozeman's city limits was only 63 percent of Missoula's city limits population. By the year 2000 the projected population for the city of Bozeman could be 69 percent to 98 percent of Missoula's projected population. By the year 2000 Gallatin County (including Bozeman) may have a population of between

TABLE 1

COMPARISON OF BOZEMAN WITH OTHER MONTANA TOWNS
THAT HAVE AMBIENT AIR QUALITY VIOLATIONS
(METEOROLOGY, TOPOGRAPHY, POPULATION, VIOLATIONS)

	BOZEMAN	BUTTE	GT. FALLS	MISSOULA	BILLINGS
AVERAGE ANNUAL WIND SPEED	9	8	13	7	12
AVERAGE ANNUAL TEMPERATURE	42°F.	38.4°F.	45°F.	43°F.	47°F.
TOTAL PRECIPITATION	19"	12"	15"	13"	14"
NUMBER OF DAYS WITH PRECIPITATION OVER .01" EACH YEAR	120	105	104	139	113
POPULATION (1970)					
CITY	18,670	23,368	60,091	29,497	61,581
COUNTY	32,505	41,981	81,804	58,263	87,367
PROJECTED POPULATION (2000)					
CITY: (DCA) (Blue Ribbon St. Nov.'77)	32,864 (47,000)	27,044 0	69,201	47,538	118,530
COUNTY: (DCA) (Blue Ribbon Study)	55,394 (105,805)	48,148	94,773	100,076	180,968
VIOLATIONS					
TSP	none	yes	yes	yes	yes
CO	none	none	yes	yes	yes

55 percent and 105 percent of Missoula County's projected population. The fact Bozeman may grow as big as Missoula means that Bozeman may have, in the relatively near future, the same type of TSP problem which Missoula has now, particularly if the pattern of growth in Bozeman continues to resemble the urban sprawl around Missoula.

5) VIOLATIONS: Please see Table 1 for the types of ambient air quality violations occurring in the Montana towns comparable to Bozeman.

6) CONFORMITY WITH OTHER CONTROLS OR REGULATIONS:

a. State Implementation Plan: The current State Implementation Plan does not have any specific provisions applicable to this proposed shopping center.

b. The State of Montana Air Quality Rules (August 6, 1976)¹ do not contain any provisions which are in conflict with the proposed shopping center.

B. Effect on CO Concentrations at the Microscale (around the shopping center).

1) Based on the development plan the most congested intersection will be where U.S. Highway 191 (U.S. 191) and College Street join the access road to the proposed shopping center (Map #2).

a. 1980 Projections: The predicted "worst-case" concentrations for CO were 10.6 ppm for a one hour period (the national ambient air quality standard is 35 ppm) and 7.4 ppm for an eight hour period (the national ambient air quality standard is 9 ppm). Judging from these predicted concentrations, it is unlikely violations of CO standards will occur in 1980 at the most congested intersection near the Main Mall (Appendix B).

1 a.) ARM 16-2.14 (1)-S1420: INCINERATORS

Any stores in the proposed shopping center which would like to have incinerators will have to get permits from the Department of Health and Environmental Sciences.

b.) ARM 16-2.14 (1) S1440: PARTICULATE MATTER, AIRBORNE

(1) No person shall cause or permit the handling or transporting or storage of any material in a manner which allows or may allow controllable particulate matter to become airborne.

(2) No person shall cause or permit a building or its appurtenances or a road, or a driveway, or an open area to be constructed, used, repaired or demolished without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne, including, but not limited to, paving or frequent cleaning of roads, driveways and parking lots, application of dust-free surfaces, application of water, and the planting and maintenance of vegetative ground cover.

c.) ARM 16-2.14 (1) -S14040: AMBIENT AIR QUALITY STANDARDS

The proposed shopping center will be expected not to violate any federal or state ambient air quality standards. If it appears that violations are likely to occur or do occur, corrective measures will be required. Presently, the State is in the process of defining exactly what its ambient air quality standards are.

b. 2005 Projections: The predicted "worst-case" concentrations for CO at the most congested intersection near the proposed mall in the year 2005 will be:

- i) a one hour concentration of 21 ppm (federal standard - 35 ppm) and
- ii) an eight hour concentration of 13 ppm (federal standard - 9 ppm) (Appendix C).

Although it appears eight hour concentrations will violate the federal standard, the actual prospect of this occurring appears unlikely since the factors used in these calculations are based on 1975 Environmental Protection Agency (EPA) emission factors. By the year 2005 the amount of emissions from the intersection will depend on the effectiveness of the emission control devices. It seems reasonable to assume that the automobile emission control devices will be at least 44 percent more effective for controlling CO emissions in 2005 than they were in 1975.

c. Suggestion: The impact of the shopping center intersection on the air quality should be modeled approximately every five years. That would enable relatively accurate average daily traffic (ADT) estimates and emission factors to be used.

2) The Main Mall's Parking Lot

- a. It is unlikely there will be any violation of the federal ambient air quality standards in the parking lot in 1980. Projections indicate that during the peak traffic-hour only 700 cars will be entering and leaving the 32-acre parking lot.²
- b. In the year 2005 the ADT will be twice that which was estimated for 1980, therefore the CO concentration will be approximately twice as high.³ But CO emissions from moving vehicles will probably be lower due to better pollution control devices and more efficiently built cars. Therefore, there should not be any violations of federal air standards in the parking lot.

C. Effect on TSP Concentrations at the Microscale.

- 1) It has been estimated that particulate emissions will amount to around nine tons a year. This can be broken down to 8.5 tons a year from automobile emissions and .57 tons a year from fugitive dust. It is assumed that most of the particulate matter settling on the parking lot and roads in the shopping center will be blown away, washed away or ground up until it is small enough to be blown away. About six percent of the loading (the amount of particulate that settles) on the parking lot will eventually be suspended in the air due to the parking lot design and the absence of any management plan for cleaning the parking lot (Appendix D).

$$2 \frac{14,000 \text{ ADT}}{2} \times \frac{1}{2} \text{ (only half of the year 2005 ADT is expected to occur by 1980)} \\ \times \frac{1}{10} \text{ of } \frac{\text{daily trips}}{\text{peak hour}} = \frac{700 \text{ trips}}{\text{peak hour}}$$

The peak hour traffic of 700 cars creates only 12 cars/minute moving around the parking lot. Even if all 700 ADT occurred on one driving lane 10 meters in front of a receptor (air monitoring device), the predicted hour maximum concentration of CO is only 3.5 ppm (this assumes the capacity of the lanes in the shopping center to be 1,320 vehicles, driving at 20 miles per hour (mph) with 80 feet between each vehicle).

$$3.5 \text{ ppm/l hour} \times 2 = 7 \text{ ppm/l hour}$$

- 2) Using the estimate for the amount of particulate that settles on the parking lot each year, it is possible to estimate the maximum concentration of TSP in the ambient air at the shopping center--59 $\mu\text{g}/\text{m}^3$ (Appendix E).

It is possible the actual emissions from the proposed shopping center will be over the estimated emission density that created violations in locations comparable to this one.

- 3) Suggestions:

The following recommendations are actions that can be taken to reduce or eliminate the amount of particulate in the parking lot.

a. Clean Roads and Parking Lots

- i) Large debris should be removed to prevent it from being ground into small particles and blown into the air or flushed into the stormwater runoff.
- ii) Small particles could be removed by either vacuum sweeping or flushing. Flushing is more effective in terms of air quality, but it puts a larger burden on water quality considerations.

b. Windscreens

Due to the difficulty of picking up small particles, a means for preventing the small particles from becoming airborne could be used. If the wind blowing across the parking lot is interrupted by windscreens such as trees, shrubs, walls or buildings, the emissions into the air will be reduced. The windscreens could be located at the boundary of the site and staggered across the parking lot. Such landscaping would have additional benefits in terms of providing shade, aesthetics, and a clean air reserve for diluting pollutants. A green strip or park along the existing perennial stream would be effective in reducing TSP emissions.

c. Landscaping

Open areas of grass or shrubs would provide a means for absorbing particulate matter before it was ground up or suspended.

d. Speed Limits

The particulate emissions will be reduced if vehicle speeds are relatively low within the proposed shopping center.

- e. Reduce the amount of paved parking spaces provided. There will be 2,129 parking spaces according to Dan Altimore of William Fiedler Associates, Spokane, Washington.

Using two different methods for determining parking spaces (Appendix F) it appears the planned estimate has from 113 to 460 more spaces than is necessary. It's possible the excess spaces could be replaced with screens, structures or landscape conducive to maintaining air quality.

D. Effect on CO Concentrations at the Scale of the Entire Bozeman Community

The direct emissions from the proposed shopping center will have a small effect upon the CO background concentrations in the entire Bozeman area. This is because the CO emissions occurring at the proposed shopping center and on the highway in front of the shopping center will be dispersed into such a large area.

However, the indirect effect of the proposed shopping center on the Bozeman area's CO concentration will be detrimental to some degree. The proposed shopping center is located away from the demographic center of Bozeman and will require its customers (who will be coming from all over Bozeman) to make longer vehicle trips under more congested traffic conditions. When a vehicle travels farther additional energy is required and more CO emissions are created, all other things being held constant. The worse the traffic congestion, the more CO emissions will occur. Basically, the proposed shopping center will mean people will have to travel farther to satisfy their needs and wants. This increase in travel will raise the background concentration (minimum level) of CO in Bozeman.

E. Effect on TSP Concentrations at the Scale of the Entire Bozeman Community

The direct effect of the proposed Main Mall on TSP levels in Bozeman will be very slight. It is unlikely the proposed shopping center could cause violations of ambient air quality standards away from its immediate surroundings. However, the emissions from the proposed shopping center will contribute slightly to the general background concentration in Bozeman. The proposed shopping center will increase the total vehicle miles traveled in Bozeman and concurrently increase TSP:

- 1) The emissions from paved roads will increase as the vehicle miles traveled (VMT) increases,
- 2) the emissions from unpaved roads will increase since a sprawling community will not be able to afford to pave as many of the outlying or low density development roads,
- 3) the emissions from the vehicles themselves will increase because the vehicles will be driven farther each year.

To mitigate the negative impact of increased travel on a community's air quality it is desirable to develop patterns of land use that reduces the amount of driving to satisfy people's needs and wishes. Usually such a pattern would either integrate different land uses that are compatible with each other or facilitate some degree of mass transit that would link pedestrian-oriented activity centers. Any pattern of land use planning should include a consideration of the cumulative impact on air quality due to individual land use changes.

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United States Department of the Interior MAR -6 1978
GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092
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Environmental Sciences Div.

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-Mail Stop 760

MAR 2 1978

Mr. Tom Ellerhoff
Environmental Science Division
Department of Health and Environmental Sciences
Board of Health Building
Helena, Montana 59601

Dear Mr. Ellerhoff:

We have reviewed the draft environmental statement for the Main Mall shopping center in Gallatin County as requested in the letter of January 5 from Messrs. Wheeler and Willens.

The culvert for piping a small perennial stream under the mall is apparently proposed to be sized only for "normal" flow (p. 3, par. 1). We suggest that the provisions for handling flood flow should be described. The location of the channel is not indicated on the maps nor is the size of its drainage area given. Thus, it is not clear if there are feasible alternatives for preserving this channel.

We suggest that the draft statement should more fully address the impacts of the operation of the proposed dry wells on ground-water resources. It would be well to summarize the significance of the aquifer affected and the probable extent as well as the severity of impacts. The analysis should include the probable rate of infiltration of storm water into the shallow ground-water reservoir and should discuss planned treatment of the storm water to mitigate impacts. Other traffic-related contaminants such as asbestos fibers might also be considered in the evaluation.

Thank you for the opportunity to make these suggestions.

Sincerely yours,

Henry W. Collier
for
Acting Director



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DEPARTMENT OF THE ARMY
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6014 U.S. POST OFFICE AND COURTHOUSE
OMAHA, NEBRASKA 68102

VI. LETTERS AND RESPONSES

MAR -1 1978

MOTTS

Environmental Sciences Div.

22 February 1978

WROPD

Mr. Tom Ellerhoff
Environmental Sciences Division
Department of Health & Environmental Science
Board of Health Building
Helena, Montana 59601

Dear Mr. Ellerhoff:

This responds to the Environmental Science Division's notice of 25 January 1978 which enclosed a Draft EIS for the Main Mall Shopping Center, Bozeman, Montana for our review and comment.

Although the Draft EIS indicates the presence of a perennial stream within the site, the Draft EIS does not discuss the flood threat potential, any details of proposed changes to the stream, or the impacts of such changes. Further inquiry revealed that the stream is proposed to be contained within a 36 inch buried conduit. In this event, an additional analysis should be carried out to determine the flow pattern of a 100-year flood assuming the conduit both fully operative and plugged. The resultant flood limits should then guide the grading development of the parking lot and the first floor elevations of the buildings. We recommend the buildings be constructed at least 1 to 2 feet above the 100-year flood flow elevations.

We are also unable to determine if the stream falls under the Section 404 permit program. Since it may, we have attached a Special Note relative to that program. Permits are required prior to the start of construction for any fill activity in streams which flow more than 5 c.f.s. 50 percent of the time; natural lakes larger than 5 surface acres and their adjacent or contiguous wetlands.

Please note that this review of your Draft EIS is not intended to convey or give Corps of Engineers approval to the Draft EIS or to the proposed project in connection with any Section 404 permit action or procedure.

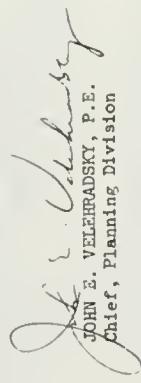
- 3) The Gallatin County SCD is the permit granting authority.
- 4) According to available information, the Water Quality Bureau, DHES, does not believe the stream flows more than 5 c.f.s. 50 percent of the time.
- 5) Comment noted.

MROPD
Mr. Tom Ellerhoff

22 February 1978

We appreciate the opportunity to review and comment on your Draft
EIS.

Sincerely yours,



1 Incl
As stated

STATE OF MONTANA
ENVIRONMENTAL QUALITY COUNCIL

CAPITAL STATION



RECEIVED

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Highway Department
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APPROVED: STEPHEN
H. WHEELER
Highway Department
State of Montana
100 North 25th Street
Helena, Montana 59601

February 8, 1978

Dr. Arthur C. Knight
Director
Department of Health and
Environmental Sciences
Helena, Montana

Attention: Mr. Thomas M. Ellerhoff
Environmental Sciences Division

Dear Dr. Knight:

As requested by Mr. Wheeler and Mr. Willem of the Department of Highways and Department of Health respectively, we have reviewed the Draft EIS regarding the Main Mall shopping center in Gallatin County. We feel the following comments deserve consideration.

The EIS describes the presence of a perennial stream traversing the boundaries of the proposed Main Mall. The EIS immediately proposes altering the stream's course without studying the impacts upstream or downstream from the Mall. Up and downstream bank erosion from the impacted area is a fairly common occurrence when stream alteration is practiced. We think the problem that may be introduced and the proper mitigation techniques should be addressed in the EIS.

The problem of precipitation runoff and percolation into the soil is dwelled upon, but again, a solution is not proposed in the EIS for the protection of either the groundwater or the perennial stream. The sentence on page 3, "So, if adequate suspended solids removal facilities are provided, water quality standards for lead should not be violated.", comes short of a detailed or even general explanation of technique.

Regarding the aesthetics of the perennial stream, the Fish and Game Department's recommendation for a greenway through the Mall along the stream's banks appears desirable. A greenway will not only improve the aesthetics but also help water quality by deterring erosion and providing stream shade. A tri-weekly litter crew hired by the Main Mall proprietors could patrol the greenway clearing the area of litter.

VI. LETTERS AND RESPONSES

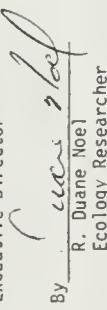
- 6) Reference the discussion of the SCD's 310 permit on page 4.
- 7) The DHES feels water quality standards can be met if adequate suspended solids removal is provided. There are a number of methods that can be used. The DHES does not dictate the removal methods; it reviews the adequacy of the proposed methods. DHES has reviewed storm water treatment plans submitted by the developer as stated in Section III.
- 8) Aesthetic qualities of the proposed development are up to the discretion of the developer. The Department of Fish and Game's recommendation for a greenway along the stream is an alternative the developer can consider.

Dr. Arthur C. Knight Attention: Thomas Ellerhoff
February 8, 1978
page two

On page 14 under the subtitle Primary, Secondary and Cumulative Impacts, stream alteration would probably create a primary impact, rather than a secondary impact.

We appreciate this opportunity to comment.

Sincerely,

TERRENCE D. CARMODY
Executive Director
By 
R. Duane Noe
Ecology Researcher

9) Comment noted.

Office Memorandum •

STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

VI. LETTERS AND RESPONSES

TO : Tom Ellerhoff
FROM : Tom Schmidt

DATE: February 22, 1978

SUBJECT: Comments on Draft EIS for Main Mall Shopping Center, Bozeman, MT

P.2 The Fish and Game Department ponds: The developer of the shopping center should not detract from unusual aesthetic values in the area of his development. Suggestions are for him to, 1. landscape the land on his property which borders the F & G ponds, 2. provide some attractive screening between the ponds and his development. 3. design the plan for the shopping center to take advantage of the aesthetic value of the ponds, e.g. putting a restaurant on the periphery of the ponds so that customers can enjoy the view of the ponds while they are eating. The important thing is for unattractive features of the shopping center to be kept from interfering with the aesthetic values of the ponds, e.g., parking lots and service areas.

10) Reference response #8.

P.2 The Perennial Stream: The stream should not be allowed to be put within an underground culvert. The stream provides a unique aesthetic quality for the area. If it is buried, its value will be destroyed. The developer should design his shopping center to take advantage of the stream which runs through it. The stream could have a walkway by it and a pedestrian bridge or two across it for shoppers to get to their cars. Shade trees could be planted along the stream banks to provide shade in the summer and to provide a wind break in the winter. From an air quality point of view the parking lot will generate less particulate matter if its surface area is interrupted. If the stream is preserved above the surface, it will provide a more pleasurable experience for the shopper. F & G's recommendation that a greenway be created through the development is strongly endorsed.

P.3 Stormwater Runoff: The developer should consider ways of minimizing the amount of runoff created. A semi-permeable surface on the parking lot, a material with spaces in it for the passage of water into the ground below, or some porous material would help. It would be ideal if the runoff could be put back into the water table in a relatively clean condition. It is wasteful of resources to cause storm water runoff because large unporous surfaces were used and then have to build storm drains to remove the water and expensive plants to clean the water.

P. 8 Air Quality: The comments on the effect of the proposed shopping center are simplistic and probably wrong. If the shopping center attracted only people from the quadrant of the city it is in, the shopping center would probably help air quality. In such a case the shopping center would actually be reducing the vehicle miles that had to be traveled to satisfy human needs. However, if the proposed shopping center attracts people from all over Bozeman, it will be causing people to drive farther than they had been driving before and the total miles driven in Bozeman will be larger. The air quality in terms of total suspended particulates and carbon monoxide is worsened by an increase in vehicle use (usually measured by vehicles miles traveled); therefore, since the people will be traveling farther, the vehicle miles travelled will increase and the level of air pollution will increase. It is likely that this second situation is more probable because the shopping center is a very large one and will contain stores of more than merely a local or neighborhood interest.

11) Reference response #8 and the SCD's 310 permit on page 4.

12) Based on the literature, a semi-permeable surface would be one way of minimizing runoff problems. However, the DRES prefers to review proposed methods as long as water quality standards are met. A semi-permeable surface probably would need to be backed up with some sort of ponding system to catch runoff during chionooks when the ground is frozen.

13) Reference the air quality discussion on page 4.

The creation of an additional shopping center will worsen air quality in Bozeman if it draws customers from all over Bozeman.

A second consideration is how significant is that additional damage to the air resources of Bozeman? It is extremely unlikely that this one proposed development and its use will create violations of national ambient air quality standards. However, this proposed development does have a significance. The Bozeman community cannot "sprawl" westward if it is going to maintain adequate air quality. The Bozeman community needs a comprehensive plan which is compatible with maintaining good air quality. That comprehensive plan should attempt to reduce vehicle miles traveled per person per year as opposed to encouraging that ratio to increase. The greater the number of vehicle miles traveled per person the worse the air quality of a community will be unless the community is at a very low density.

Deteriorating air quality does not have to occur if the community provides accessibility for its citizens through efficient land use patterns rather than increasing the mobility of all citizens. Either way their needs are met; but the dependency upon the auto for mobility will eventually yield unacceptable consequences.

The integration of various types of land use so that home, work, shopping and play can be all relatively close together would greatly reduce air quality problems from vehicle use in communities.

P. 8 A shopping center's parking lot can be the source of large amounts of CO emissions. The effect of these emissions may be mitigated by breaking up a large parking lot into several smaller areas by providing trees that act to dissipate any pollution tending to build up, by preventing cars from spending a great deal of time idling, by creating a traffic flow pattern in the parking lots which helps the cars move smoothly as opposed to being stopped and idling.

P. 8 Because "the proposed shopping center is part of an area "zoned for highway commercial development" there is greater reason to fear increased air pollution. Commercial strip development along a highway creates congestion because the amount of traffic making turning movements interferes with the capacity of the highway to move traffic. Buildups of slow moving cars or idling cars occur. These cars create emissions at a much greater rate than if they were flowing smoothly; consequently, the concept of an area zoned for commercial highway development is harmful to air quality. Highway 93 (Brooks Avenue) in Missoula is an example of that. Because of the effect of commercial strip development, it is difficult to imagine how such zoning can be compatible with community goals and included in a rational plan for community growth and development.

P. 13, 15 The number of approaches and the proximity of the approaches seem to be incompatible with preventing congestion and promoting traffic safety. The three approaches in the 540 foot section along the highway average between 20 to 29 approaches per mile. Few people would look forward to driving through a gauntlet like that. The number of access/express points to the highway should be severely limited and the shopping center should not be permitted 3 entrances/exits.

VI. LETTERS AND RESPONSES

14) Reference the air quality discussion on page 4.

15) Reference the air quality discussion on page 4.

16) Comment noted.



Mr. Tom Ellerhoff
Environmental Sciences Division
Department of Health and
Environmental Sciences
Board of Health Building
Helena, Montana 59601

Dear Mr. Ellerhoff:

We have reviewed the Draft Environmental Impact Statement for this project and we offer the following comments on transportation related impacts:

1. Page 12 - Reference is made to the statement "the mall should not alter current shopping patterns or use of automobiles". The proposed mall will alter existing trip patterns geographically and may cause certain portions of West Main Street to become substantially congested. The approaches and traffic patterns are being studied by the Department of Highways to properly locate the approaches to best serve the shopping center and to promote safety.
- 17) Comment noted.
2. Page 13 - The true traffic impact would appear to be the reaching of maximum capacity on U.S. 191 and College. This condition will probably be reached sooner because of traffic generated by the West Main Mall.
- 18) Comment noted.
3. Other costs that might be included are the costs of providing new improvements to U.S. 191 and College Street at an earlier date than may otherwise have been needed.

In addition to these transportation concerns, we have noted several other topics which are beyond our area of responsibility but which are offered for your consideration.

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
FEB 24 1978
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FEDERAL HIGHWAY ADMINISTRATION
FEB 24 1978

VI. LETTERS AND RESPONSES

1. Page 2 - There is a need to show the location of the perennial stream on the proposed mall site since it is substantially discussed and could, if modified, cause impacts to other land uses or transportation facilities.

2. Page 9 and 10 - The method used to calculate Percentage is in error. A growth of \$17,698,000 to \$30,318,000 is an increase of 718 not 58 percent.

3. Page 11 - Reference is made to the statement - "However, the chief didn't feel the development would directly lead to the hiring of an additional officer, . . ." Quantification of this impact may be more appropriately expressed in terms of the number of minutes per hour, day, or month that will require Police protection (per policeman). It would seem that some police and fire protection will be needed. The real impact may be the difference between providing Police and fire protection to a mall as compared to providing the services to a number of separate commercial entities.

4. Page 11 - The question is not so much the existence of the mall but the type of shopping goods sold that would tend to harm the downtown area. It could be that additional analysis needs to be done comparing the West Main Mall, University Mall and Bozeman Central Business District goods and services marketed or to be marketed, to better understand the economic impacts. The possible enticement of major downtown businesses to move to the mall may be an impact, however the mall may also be making room for the expansion of existing Central Business District businesses and parking. The benefits attributed to the development are in general only valid if it represents true area growth and not a relocation of Central Business District facilities as charged by some "downtown interests".

5. Page 11 - "Should not affect" seems to be a poor choice of words since anything that uses electricity or natural gas is consumed and cannot be given to another. The proposed mall would use substantially more amounts of these resources than a residence.

6. Other costs that might be included are the loss of investments by some businesses in the Central Business District as a result of anticipating redevelopment.

The opportunity to comment on this draft statement is appreciated. If we can be of any further assistance, please advise.

33-SCK/LJI/ja

Very truly yours,

RONALD P. RICHARDS
DIRECTOR OF HIGHWAYS

cc H. G. Wheeler
D. S. Johnson
R. C. Holmes
K. F. Skoog
A. G. Zbitnoff
R. A. Howell

By *Stephen C. Kologi, P.E.*
Stephen C. Kologi, P.E., Chief
Preconstruction Bureau

20) The approximate location of the stream is shown on Map #1.

21) Correction noted.

22) The question of police and fire protection relates specifically to the mall. Bozeman Police Chief William Nelson discussed the matter several times and each time felt the mall would not be directly responsible for requiring the addition of an additional officer, however it would add to the cumulative need for more personnel.

23) Comment noted.

24) Comment noted.

25) Comment noted.

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THOMAS FEB 07 1978

GOVERNOR

Montana
Environmental Sciences Div.

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS

HELENA, MONTANA 59601
February 3, 1978

0026:JDC

Tom Ellerhoff
Environmental Sciences Division
Department of Health and Environmental Sciences
Board of Health Building
Helena, Montana 59601

Dear Mr. Ellerhoff:

In review of the draft Environmental Impact Statement prepared for the proposed Main Mall Shopping Center in Gallatin County the following comments have been generated by the staff of the Department of Highways Planning and Research Bureau.

- 1) Page 16 - Under the section on Environmental Benefits and Costs we note for your consideration as a possible environmental benefit the high density utilization of the land by this proposed mall development. The continued consumption of land by sprawling non-dense strip commercial development is an inefficient land use - - - - a waste.
- 2) Appendix - Page 4 - Under Summary: Trip Generation The paragraph following the Tables ("In evaluating the range....." should be revised to read as follows:

As noted in the Gruen documentation the square foot method is considered a more desirable estimate of commercial trip generation. In evaluating the range produced by this projection technique.....
- 26) Comment noted.
- 27) Correction noted.
- 28) Correction noted.
- 3) Appendix - Page 6 - Reference to Figure 3 Figure 3 is missing from the draft document. Care should also be taken to make all figure references correspond to the appropriate draft document figure displays. As the draft now reads, the reader would be drawn back to Figure 3 Page 6-a of the text which is entitled "Estimated Sewage Flows Entering the Bozeman Sewage Treatment Plant..." and not the Main Mall service area display as intended.

The comments are being submitted to you for your consideration. We would be most happy to discuss our review and findings with you should you have any additional questions or require further explanation. Please direct your correspondence to:

John D. Craig, State Planner IV
Planning and Research Bureau
Montana Department of Highways
Hustad Center
Helena, Montana 59601

Phone: 449-3740

Very truly yours,

RONALD P. RICHARDS
Director of Highways

By 
James W. Hahn, Chief
Planning and Research Bureau

RECEIVED

FEB 14 1978



VI. LETTERS AND RESPONSES

226 N. Roberts

PHONE (406) 741-2014

FEB 14 1978

February 10, 1978

Mr. Tom Ellerhoff
Environmental Sciences Division
Department of Health and Environmental Sciences
Board of Health Building
Helena, MT 59601

Re: Bozeman Main Mall

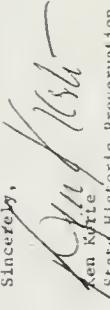
Dear Mr. Ellerhoff:

There are no identified cultural resources in the area of the proposed shopping mall in Bozeman. We know of no surveys in this area. Unrecorded sites may be present.

Should the proposal be accepted, we recommend that a cultural resource inventory be conducted on the site, and the report of such inventory be submitted to this office for further comment.

Thank you for consulting with us in your review process.

Sincerely,


Karen Korte
State Historic Preservation Officer

nk/prb

VII. FINAL RECOMMENDATIONS

The final recommendations by the DHES and DOH are the same as those stated in the draft EIS (Refer to II. Recommendations, page 1).

APPENDICES

APPENDIX A

GALLATIN CONSERVATION DISTRICT
P. O. Box 1017
Bozeman, MT 59715
587-5271 EXT. 4278

December 20, 1977

Mr. H. A. Bolinger
Attorney at Law
136 East Main
Box 1047
Bozeman, MT 59715

Dear Mr. Bolinger

SUBJECT: SENATE BILL 310 APPLICATION SUBMITTED FOR HARRY AND
KATHLEEN DAUM

Your request for a 310 permit for the Main Mall shopping center is
granted subject to the following conditions:

- 1) Plans for removal of grease and sludge from the parking lot
areapproved by the State of Montana Department of Health and
Environmental Sciences.
- 2) Sediment pollution into the stream is to be held to a minimum
during periods of construction.
- 3) A green belt area may be left for the stream area or the stream
may be covered with a culvert. If the stream is enclosed in a
culvert an energy dissipater must be used on the exit end of the
culvert so as to prevent soil erosion in the stream channel.

If you have any questions regarding the above provisions, please
contact the Gallatin Conservation District.

Sincerely

Bonnie Cox

Bonnie Cox
District Clerk
Gallatin Conservation District

cc Ron Marcoux, Department of Fish and Game

APPENDIX B

The predicted concentrations were derived in the following manner:

A. SHOPPING CENTER ADT = $\frac{1}{2}$ of 14000 Average Daily Traffic (ADT) projected for year 2000. It was assumed that half of the expected ADT for the proposed shopping center would occur by 1980, because the shopping center would not operate for long if it did not have half of its expected consumers shopping there shortly after it opened.

B. INTERSECTION CONFIGURATION: It was assumed that U.S. Highway 191 would still be only two lanes wide, College Street would still be only two lanes wide, and the number of lanes at the intersection into the shopping center would be either two or four (it doesn't affect the predicted concentrations).

C. ADT FOR EACH LEG OF INTERSECTION: The ADT for the intersecting legs was calculated by assuming the growth of traffic through the intersection over time would be linear (from 1977 to 2005). The 1977 ADT for the three legs was the following:

	West	South	East
1977 ADT	7602	1711	6384
Additional ADT for 3 years	1110	113	1041
Total ADT in 1980	<u>8712</u>	<u>1824</u>	<u>7425</u>

$\frac{1980 - 1977}{2005 - 1977} = \frac{3 \text{ year}}{28 \text{ years}} = 11\%$ of the difference between 1977 and 2005 is estimated to have occurred by 1980

	LEGS OF INTERSECTION		
	West	South	East
Projections for 2005 without the mall	17,690	2740	15,848
ADT for 1977	<u>7,602</u>	<u>1711</u>	<u>6,384</u>
Difference	10,088	1029	9,464
Rate of change in 3 yrs	<u>11%</u>	<u>11%</u>	<u>11%</u>
Additional ADT for 3 yrs	1,110	113	1,041

The ADT increase in 1980 is attributable solely to the proposed shopping center, and is assumed to be half of its peak amount. The Montana Department of Highways (DOH) projected an ADT of 6520 in the year 2005 at the intersection of College Street, the mall and U.S. 191. Half of that is 3260 ADT. That 3260 ADT may be assigned to the three legs based upon DOH estimates as to where customers will come from; 35 percent from the west, 35 percent from the south and 30 percent from the east in the year 2005. This can be averaged to approximately 1/3 for each of the three legs.

ADT FOR 1980 WITH PROPOSED SHOPPING CENTER

	LEGS OF INTERSECTION		
	West	South	East
1980 ADT without proposed shopping center	8712	1824	7425
1/3 of shopping center's draw for 1980 (3260)	1087	1087	1087
ADT for 1980 with proposed shopping center	9799	2911	8512

D. GREEN TIME TO SIGNAL CYCLE RATIO: It is assumed the intersection will have traffic lights installed by 1980. The percent of time the intersection signal is green for each direction of travel affects the intersection's capacity to move cars through it. The intersection capacity affects the level of emissions from the intersection. It was estimated that the east-west direction will get 50 percent of the green time, the north-south direction 30 percent of the green time, and the pedestrians and wasted time will amount to 20 percent of the total time cycle.

E. DETERMINATION OF PROBABLE MAXIMUM CO CONCENTRATION AT INTERSECTION: The EPA document Guideline for Air Quality Maintenance Planning and Analysis, Volume #9: Evaluating Indirect Sources (January, 1975) presents a relatively simple methodology for determining whether an indirect CO source like an intersection or parking lot has the likelihood of creating violations. This

EPA methodology estimates the maximum emission concentration possible. If the estimate for the indirect source comes close to a violation, either more detailed modeling should be done or the design of the indirect sources should be modified to eliminate the possible violation. The variables that are required in this EPA methodology are contained in Table # A. (Refer to Table #A)

A receptor was estimated to be 10 meters (m.) from the intersection on the north-east side; another receptor was estimated to be 10 m. from the intersection on the northwest side of the intersection. The distance is measured from the edge of the traffic lane and is perpendicular to the traffic lane.

A diagram of the intersection for 1980 is as follows:

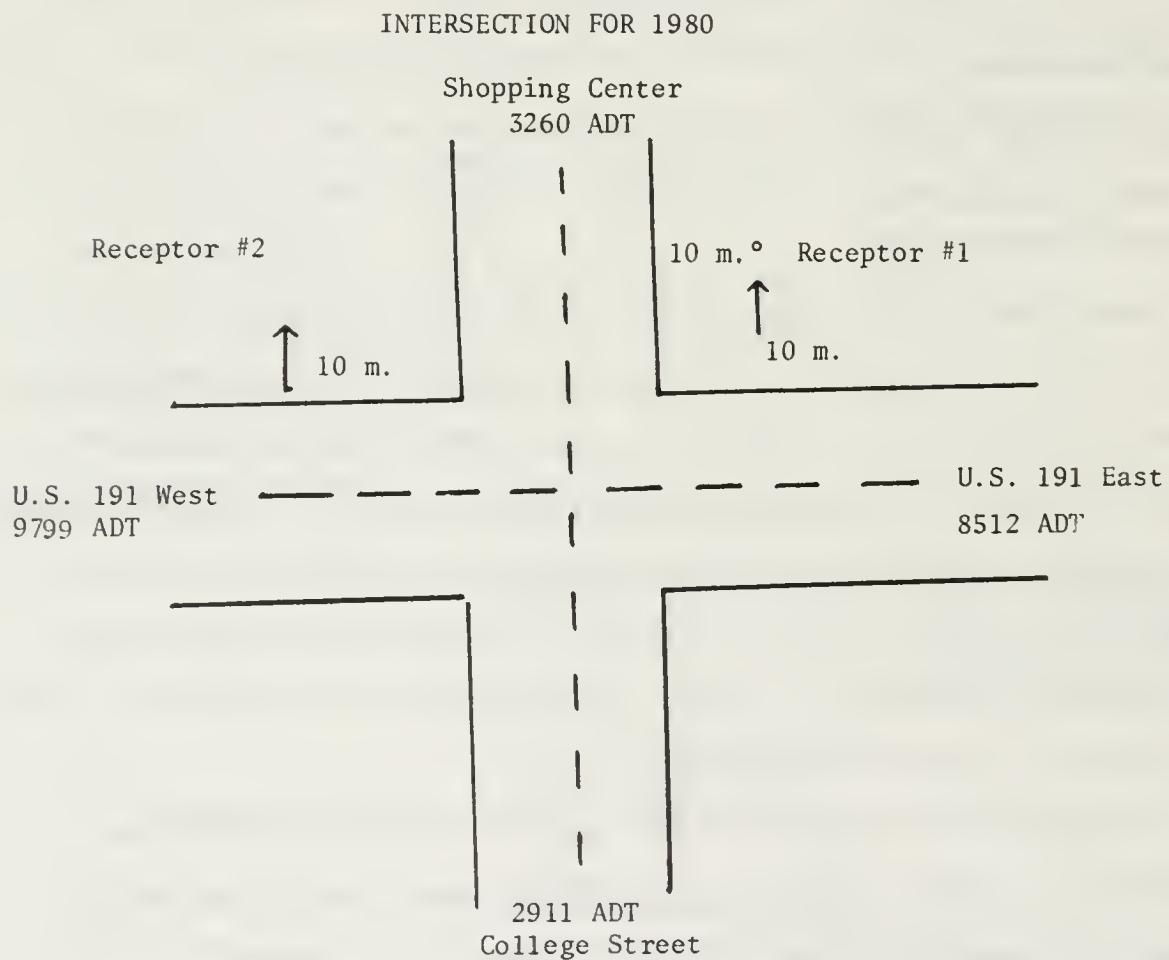


TABLE A

CO CONCENTRATION AT INTERSECTION IN YEAR 1980

RELATION OF TRAFFIC IN LANE TO SIGNAL	LANE DISCR.	ADT LANE	ADT LANE	GREEN TIME/ CYCLE	PEAK VEH. PER VEH. PER HOUR	VEH. SPEED	RECEPTOR'S DISTANCE FROM EDGE	FACTOR FOR DISTANCE	CONC. AT MID- BLOCK	PPM OF LANE DISTANCE (ppm)
Upstream	eastside to west	8512	4256	426	.5	NA	8	10 m.	1.0	8.
Downstream	eastside to east	8512	4256	426	(1.0)	30	2	14 m.	.9	1.8
TOTAL										9.8 ppm
Downstream	northside going N.	3260	1630	163	(1.0)	20	1.5	10 m.	1.0	1.5
Upstream	northside going S.	3260	1630	163	.3	NA	4.5	14 m.	.9	4.
TOTAL										5.5 ppm
Downstream	westside to west	9799	4899	490	(1.0)	35	2.5	10 m.	1.0	2.5
Upstream	westside to east	9799	4899	490	.5	NA	8.5	14 m.	.9	7.7
TOTAL										10.2 ppm

As can be seen from Table A, the maximum one hour concentration is 10.2 ppm. The federal standard is 35 ppm. The one hour reading can be converted into an eight hour estimate by using a conversion factor of ".6" which was recommended in the EPA volume mentioned before.

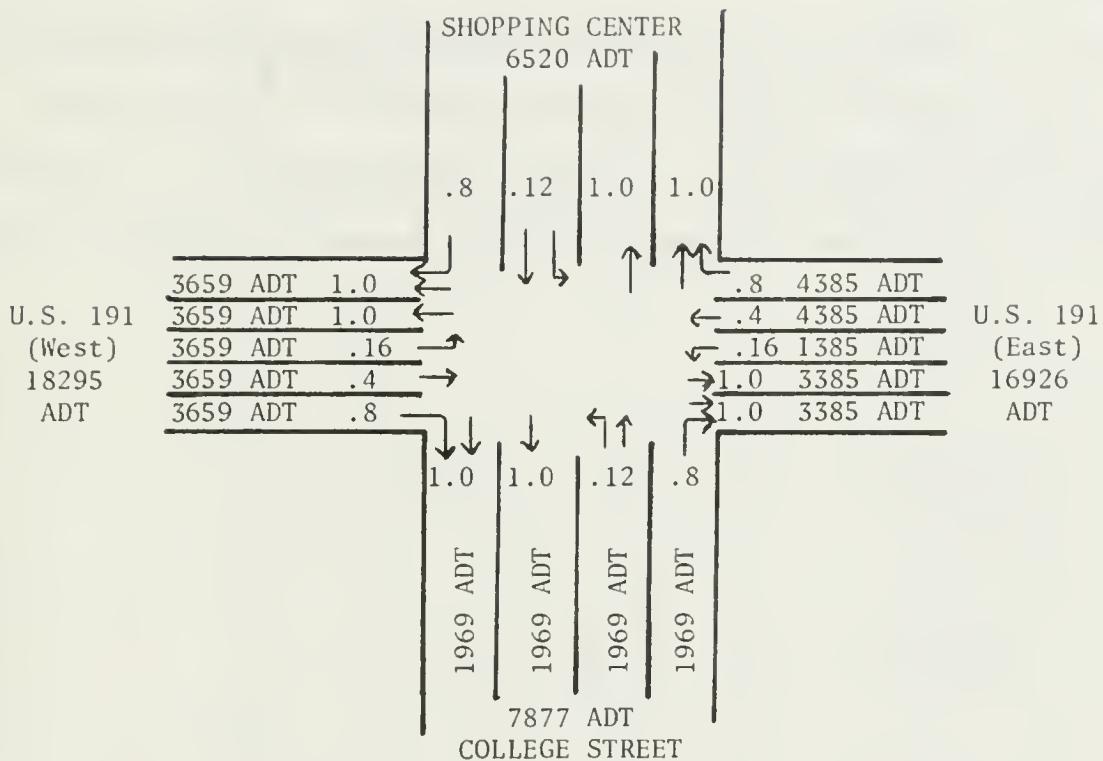
Maximum predicted 8 hour concentration = (maximum one hour concentration)
 $x (.6) = (10.2 \text{ ppm} + 2 \text{ ppm (background)}) x (.6) = 7.3 \text{ ppm/8 hours.}$

The federal standard for an eight hour period is 9 ppm.

APPENDIX C

2005 PROJECTIONS

a. The configuration of the intersection (ADT per lane, directions in each lane, ratio of green time to signal cycle time).



b. Pedestrian and caution time comprises .20 of the signal cycle

c. Signal cycle time - 90 seconds

d. 800 vehicles per hour capacity on route 191

e. 300 vehicles per hour capacity on enter/exit to shopping center

f. number of lanes: U.S. 191 (5 lanes); College Street (4 lanes); shopping center (4 lanes).

g. green time to signal cycle ratio

.4 = major movement (east-west)

.16 = left turns from east and west

.12 = left turn and through from north

.12 = left turn and through from south

$$\frac{.2}{1.00}$$
 = pedestrian and caution time

From Table A it can be seen that the worst one hour concentration predicted is 19.9 ppm. The standard is 35 ppm. A conversion factor of .6 can be used to estimate the 8 hour concentration. $(19.9 \text{ ppm} + 2 \text{ (background)}) \times .6 = 13 \text{ ppm/8 hours.}$ The predicted concentration is 13 ppm/8 hours; the standard is 9 ppm/8 hour period.

TABLE A

CO CONCENTRATION AT INTERSECTION IN YEAR 2005

-33-

RELATION OF TRAFFIC IN LANE TO SIGNAL	LANE DISCR.	ADT ADT LANE	PEAK PER VEH. PER HOUR	GREEN TIME/ CYCLE TIME	VEH. SPEED AT MID- BLOCK	RECEPTOR'S DISTANCE FROM EDGE FOR OF LANE	CONC. AT DISTANCE (ppm)
Upstream (r. turn)	eastside going W.	16926	4385	4.39	.8	NA	3.5
Upstream (through)	eastside going W.	16926	4385	4.39	.4	NA	10.
Upstream (1. turn)	eastside going W.	16926	1385	1.39	.16	NA	7.
Downstream (inside)	eastside going E.	16926	3385	3.39	(1.0)	30	2
Downstream (outside)	eastside going E.	16926	3385	3.39	(1.0)	30	2
TOTAL							<u>19.9ppm/1 hour</u>

APPENDIX D

ESTIMATE OF PARTICULATE EMISSIONS = 9 TONS/YEAR

1. Total automobile related emissions: 8.5 tons/year

Tailpipe, tire and brake emissions = .59 grams/vehicle miles traveled (VMT) (See Reference #1)

$$\frac{365 \text{ days}}{\text{year}} \times 14000 \text{ ADT} \times \frac{1 \text{ round trip}}{2 \text{ ADT's}} \times \frac{.5 \text{ miles}}{\text{Roundtrip}} \times \frac{6.03 \text{ gr.}}{\text{VMT}} =$$

$$7,703,325 \text{ grams/year} \times \frac{1 \text{ lb.}}{453.59 \text{ gr.}} \times \frac{1 \text{ ton}}{2,000 \text{ lb.}} = 8.49 \text{ tons/year}$$

2. Fugitive dust emissions = .57 tons/year

The emissions from the parking lot area can be no more than the amount of particulate matter deposited on the parking lot and the emissions must be under 40 microns in size (1 micron = 1 millionth of a meter) to become suspended in the air and to be measured by Hi-vol samplers.

19320 1b/curb mile/year x 1 curb mile x 6%* x 1 ton/2000 1b. = .57 ton/yr
proposed shopping center

a. Justification for saying that 19320 lb/curb mile/year is an acceptable figure for the deposition rate in the parking lot.

- 1) a curb mile is considered as the area between both curbs for a mile of road.
- 2) The following derivation was used to get an estimate of the deposition of particulate matter on the parking lot and roads within the parking lot. (See Reference #3)

Mud from carryout

$$100 \text{ lb/curb mile/day} \times \frac{120 \text{ days with precip.}}{\text{year}} = 12000 \text{ lb/curb mile/yr}$$

Ice control compounds (sand, salt)

$$20 \text{ lb/curb mile/day} \times \frac{36 \text{ days with snowfall}}{\text{year}} = 700 \text{ lb/curb mile/yr}$$

*(percent of matter on road less than 40 microns)

$$\text{Dustfall} \\ 10 \text{ lb/curb mile/day} \times \frac{365 \text{ days}}{\text{year}} = 3650 \text{ lbs/curb mile/yr}$$

$$\text{Pavement wear and decomposition} \\ 10 \text{ lb/curb mile/day} \times \frac{365 \text{ days}}{\text{year}} = 3650 \text{ lbs/curb mile/yr}$$

Erosion (runoff and blowing)
20 lb/curb mile/day x 150 days with precip. = 3000 lbs/curb mile/yr
or high wind
year

b. Justification for saying that 6 percent of the material in the parking lot will become airborne:

One needs to know what percent or amount of the material deposited on a paved parking lot is small enough to become airborne and to be measured by a hi-vol sampler. We will use the figure of 40 ug(microns) as the cut-off level since Hi-vol samplers don't measure particles bigger than that.

1) The draft EIS for this proposed shopping center said "Dry wells or catch basins have been shown to be ineffective for small particulates (less than 43 microns) which make up a significant amount of the pollution load." (Sertor, et. al. March 1974). This study indicated that 6 percent of the loading on the roads was less than 43 microns.

2) A detailed study of road dust in Seattle revealed that "a dusty road which had no curbs and received no cleaning had an emission of 0.83 lbs per vehicle mile, with 0.17 lbs. per vehicle miles under 10 microns." The emissions under 10 microns make up 20 percent of the total emissions.
$$\frac{.17}{.83} = 20\%$$

(See Reference #4)

Of the two above figures, 6 percent seems the more appropriate in our analysis. It is expected that not all of the small particles (under 40 microns) in the parking lot will become airborne if there is some other place for them to go.

There are other places such particulates could go:

1. Street cleaning: No provision for cleaning the parking lot was mentioned in the Draft EIS. Even if it were cleaned, it is doubtful how useful such a process would be in picking up the small particles.
2. Street flushing: This is considered the most effective way of reducing emissions of small particulate from a paved roadway. However, no provisions for street flushing were made in the draft EIS.
3. Landscaped areas: There are no provisions for grass or shrubbery or even rock gardens within the boundary of the shopping center. If landscaping were used, particulate matter moving across the parking lot would be absorbed by the trees, shrubs, etc. Without landscaped areas, the debris will remain in the parking lot until it is picked up or blown away.
4. Runoff into storm drains: The amount of particulate carried into the storm drain will reduce the amount of particulate which becomes airborne. An estimate has been made that rainfall runoff will carry away 50 percent of the particles on the parking lot if the rainfall is between .1 and .5 inches. We may therefore reduce the amount of matter left on the parking lot by 16 percent.
$$(50\% \text{ efficiency} \times \frac{120 \text{ days with rainfall above } .1"}{365 \text{ days/year}} - .16)$$
$$23000 \text{ lb/curb mile/year} \times (1 - .16) = 19320 \text{ lb/c-mile/year}$$

APPENDIX E
CONCENTRATION OF TSP

A rough estimate of the emission density necessary to have violations of the 75ug/m³ particulate is 200 tons/square mile. See page 4-11, Characterization of Particulate Sources Influencing Monitoring Sites in Region VIII Non-Attainment Area, prepared by PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, for EPA, June, 1976. For the proposed shopping center to be over this density of emissions it would have to create emissions of 11½ tons/year from its 37 acres. This figure is derived from the following proportions:

$$\frac{200 \text{ tons}}{640 \text{ acres}} = \frac{11\frac{1}{2} \text{ tons}}{37 \text{ acres}}$$

$$\frac{\text{Estimated TSP Concentration}}{9 \text{ tons/37 acres/year}} = \frac{75 \text{ ug/m}^3}{11\frac{1}{2} \text{ tons/37 acres/year}}$$

Estimated TSP concentration = 59 ug/m³. It is possible that the actual emissions from the proposed shopping center will be over the estimated emission density that would create violations in a location comparable to the ones used to develop the 200 tons/square mile rule of thumb.

APPENDIX F

PARKING SPACES

According to the following assumption and analysis:

14000 ADT

7000 Round trips to shopping center (only 5 percent of the round trips drop off passengers)

6650 cars/day requiring parking = $(7000 \times .95)$

1/15 of the trips being employees who need parking

443 parking spaces must be set aside for employees

6207 customer trips/day = $(6650 - 443)$

621 = 1/10 of the customers trips during the peak hour

476 = $(6207 - 621)$ = 1/12 of the customer trips during the remaining 11 business hours

If customer cars park one hour (avg)	621 peak hour
	476 next hour
	<u>443 employees</u>
	1540 cars requiring parking spaces
If customer cars park two hours (avg)	621 peak hours
	476 next hour
	476 third hour
	<u>443 employees</u>
	2016 cars requiring parking spaces
If customer cars park three hours (avg)	621 peak hour
	476 next hour
	476 third hour
	476 fourth hour
	<u>443 employees</u>
	2492 cars requiring parking spaces

The highest likely average length for a customer to stay is two hours. In that case 2016 parking spaces would be required. An alternative way of determining parking space requirements is to provide five parking spaces for each 1,000 square feet of gross leasable floor space.

$$260,819 \text{ sq. ft. gross leasable floor space} \times \frac{5 \text{ parking spaces}}{1000 \text{ sq. ft.}} = 1300 \text{ parking spaces}$$

If plans for expansion are included,

$$333,819 \text{ sq ft} \times \frac{5 \text{ parking spaces}}{1000 \text{ sq ft}} = 1669 \text{ parking spaces}$$

Therefore, the proposed shopping center appears to have a surplus of either 113 parking spaces (2129 - 2016) or 460 parking spaces (2129 - 1669).

References

1. Characterization of Particulate Sources Influencing Monitoring Sites in Region VIII Non-Attainment Areas, p. 157. Prepared by PEDCo - Environmental Specialists, Inc., Cincinnati, Ohio. Prepared for EPA, June 1976.
2. Guidelines for the Development of Control Strategies in Areas with Fugitive Dust Problems. EPA-450/2-77-029, Octover 1977.
3. Control of Reentrained Dust from Paved Streets, p. 155. Prepared by PEDCo - Environmental Specialists, Inc., Kansas City, Missouri. Prepared for EPA, July 1977.
4. "Dirty Roads = Dirty Air;" by John W. Roberts, August Tossani, Jr., Harry Watters, A.P.W.A. Reporter, p.11, November 1973.

Additional Sources of Information

1. Bozeman Montana Planning Area, Summary Report, Theodore J. Wirth and Associates, September 1967, Consulting Service Corporation.
2. Bozeman Growth Study, November 1977, by Blue Ribbon of the Big Sky Country A.P.O. (208 Water Quality Study)
3. City Plan for Bozeman, Montana, 1958, Summary and conclusions. S.R. Diboer and Co. City Planning Consultants, Denver, Colorado.
4. Montana Population Projections, 1977, 1975 to 2000, Montana Department of Community Affairs.
5. Bozeman Area Plan 1972, 1972, Bozeman City-County Planning Board and staff.
6. Montana AQMA Area Source Emission Inventory, December 1975, PEDCo Environmental Specialists, Inc., Cincinnati, Ohio.